

- 1 1. A system comprising:
 - 2 at least one first conductive element in contact with at least one dielectric mismatch
 - 3 boundary;
 - 4 at least one second conductive element in contact with the at least one dielectric
 - 5 mismatch boundary; and
 - 6 a receiver for receiving an electromagnetic signal from the at least one second conductive
 - 7 element, the received electromagnetic signal being based on an electromagnetic signal
 - 8 transmitted on the at least one first conductive element and being coupled to the at least one
 - 9 second conductive element in response to the at least one dielectric mismatch boundary.
- 1 2. The system of claim 1 further comprising a third conductive element surrounding at least
- 2 part of the at least one first and second conductive elements and being connected to a ground
- 3 plane.
- 1 3. The system of claim 1 wherein the at least one first and second conductive elements are
- 2 positioned substantially parallel to each other and substantially perpendicular to the at least one
- 3 dielectric mismatch boundary.
- 1 4. The system of claim 1 wherein the at least one dielectric mismatch boundary corresponds
- 2 to a region associated with at least one first substance having a first dielectric constant and at
- 3 least one second substance having a second dielectric constant.
- 1 5. The system of claim 1 wherein the electromagnetic signal exhibits an ultra-wideband
- 2 frequency.

1 6. The system of claim 1 wherein the at least one dielectric mismatch boundary corresponds
2 to a transitional region between a gaseous substance and a liquid substance.

1 7. The system of claim 1 wherein the at least one dielectric mismatch boundary corresponds
2 to a transitional region between at least two of a vacuum, a gaseous substance, a liquid
3 substance, a semi-solid substance, and a solid substance.

1 8. The system of claim 1 further comprising a transmitter for forming the electromagnetic
2 signal.

1 9. The system of claim 1 further comprising a processing element executing instructions to
2 evaluate the received electromagnetic signal relative to the transmitted electromagnetic signal to
3 determine a characteristic of at least one substance associated with the dielectric mismatch
4 boundary.

1 10. The system of claim 9 wherein the processing element communicates at least one of the
2 attributes of the received electromagnetic signal and the characteristic of the at least one
3 substance to a digital data processing device during a communication session.

1 11. The system of claim 9 wherein the attributes of the received electromagnetic signal
2 relative to the transmitted electromagnetic signal includes a time delay and the characteristic of
3 the at least one substance corresponds to a level of that substance.

1 12. The system of claim 11 wherein the time delay attribute of the received electromagnetic
2 signal relative to the transmitted electromagnetic signal is based, at least in part, on a time
3 differential between signals associated with an equivalent time sampling circuit of the receiver.

1 13. The system of claim 11 wherein the level corresponds to a volume of fluid in at least one
2 of an above-ground storage tank and a below-ground storage tank.

1 14. The system of claim 1 wherein the at least one first and second conductive elements form
2 a parallel conductor transmission line structure.

1 15. The system of claim 1 wherein the at least one first and second conductive elements are
2 flexible.

1 16. The system of claim 1 wherein the at least one first and second conductive elements
2 exhibit quadrilateral cross-sections.

1 17. The system of claim 1 wherein the at least one first and second conductive elements
2 exhibit substantially identical cross-sections.

1 18. The system of claim 1 further comprising:
2 a coupler positioned at the dielectric mismatch boundary for coupling the received
3 electromagnetic signal, the size of the received electromagnetic signal being independent of
4 dielectric properties associated with substances forming the dielectric mismatch boundary.

1 19. The system of claim 18 wherein the coupler operates as an electromagnetic shunt path
2 between the at least one first and second conductive elements.

1 20. The system of claim 18 wherein the coupler exhibits a length corresponding to at least
2 one-quarter of a propagation velocity pulse length of the transmitted electromagnetic signal.

1 21. The system of claim 18 further comprising:

2 a float for positioning the coupler relative to the at least one dielectric mismatch
3 boundary.

1 22. The system of claim 21 wherein the float includes a buoyant component and a weighted
2 component.

1 23. A method comprising:
2 transmitting an electromagnetic signal on an at least one first conductive element, the first
3 conductive element being in contact with an at least one dielectric mismatch boundary; and
4 receiving an electromagnetic signal based on the transmitted electromagnetic signal at an
5 at least one second conductive element, the received electromagnetic signal being coupled to the
6 at least one second conductive element in response to the at least one dielectric mismatch
7 boundary, wherein the at least one second conductive element is in contact with the at least one
8 dielectric mismatch boundary.

1 24. The method of claim 23 further comprising:
2 surrounding at least part of the at least one first and second conductive elements with a
3 third conductive element connected to a ground plane.

1 25. The method of claim 23 further comprising:
2 evaluating attributes of the received electromagnetic signal relative to the transmitted
3 electromagnetic signal to determine a characteristic of at least one substance associated with the
4 dielectric mismatch boundary

1 26. The method of claim 25 wherein the attributes of the received electromagnetic signal
2 relative to the transmitted electromagnetic signal includes a time delay and the characteristic of
3 the at least one substance corresponds to a level of that substance.

1 27. The method of claim 23 wherein the at least one first and second conductive elements are
2 flexible.

1 28. The method of claim 23 further comprising:
2 providing a coupler positioned at the dielectric mismatch boundary for coupling the
3 received electromagnetic signal to the at least one second conductive element, the size of the
4 received electromagnetic signal being independent of dielectric properties associated with
5 substances forming the at least one dielectric mismatch boundary.

1 29. The method of claim 28 further comprising:
2 providing a float for positioning the coupler relative to the at least one dielectric
3 mismatch boundary.